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A case of lung cancer with osteoblastic metastasis diagnosed with visual impairment

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ABSTRACT

Bone metastasis is relatively common in patients with lung cancers. Although there are some reports of osteolytic skull base metastasis in lung cancer, osteoblastic skull base metastasis is quite rare. A 56-year-old male presented with lung adenocarcinoma who developed vision loss due to papilledema in both eyes with intracranial hypertension. Magnetic resonance imaging revealed no obvious lesions in the intracranial space. Bone scintigraphy, magnetic resonance venography, and computed tomography showed left internal jugular vein stenosis with osteoblastic metastasis protruding into the left jugular foramen. Ventriculoperitoneal shunt surgery improved papilledema and ameliorated vision loss. This case is a reminder that a patient with lung cancer can demonstrate osteoblastic skull base metastasis, and ventriculoperitoneal shunt surgery is an effective and palliative method for such patients.

1. Introduction

Lung cancer accounts for 30–40% of bone metastases [1]. In particular, skull bone metastases is reported in approximately 1.5% of cases [2]. Generally, lung carcinoma shows osteolytic metastasis, and few cases report osteoblastic lesions during the course of the disease [3]. Here, we present a rare case of a patient with visual impairment due to skull base metastasis of lung cancer. Appropriate patient consent was obtained for this study.

2. Case report

A 56-year-old male presented with an abnormal shadow on the right side of his chest during a physical examination (Fig. 1A). Lung biopsy revealed a lung adenocarcinoma. Chemotherapy (carboplatin and gemcitabine) and radiotherapy were administered. Three years later, the patient developed vision loss in his right eye. Magnetic resonance imaging (MRI) revealed no lesions in the intracranial space. Steroid treatment was initiated for suspected Harada disease. One year later, visual acuity in the left eye also deteriorated, and papilledema was observed in both eyes. There were no obvious occupying lesions in the

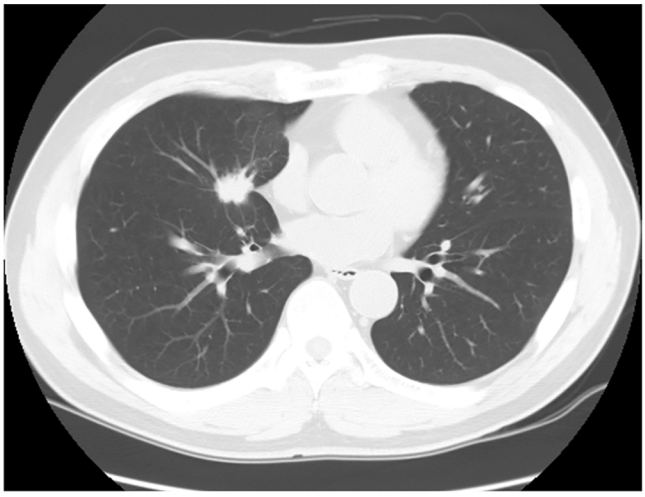

Fig. 1. Initial chest computed tomographic scan in the lung window showed a solid nodule in the right middle lobe.

Abbreviations: CSF, cerebrospinal fluid; CT, computed tomography; MRI, magnetic resonance imaging; MRV, magnetic resonance venography; VP, ventriculoperitoneal.

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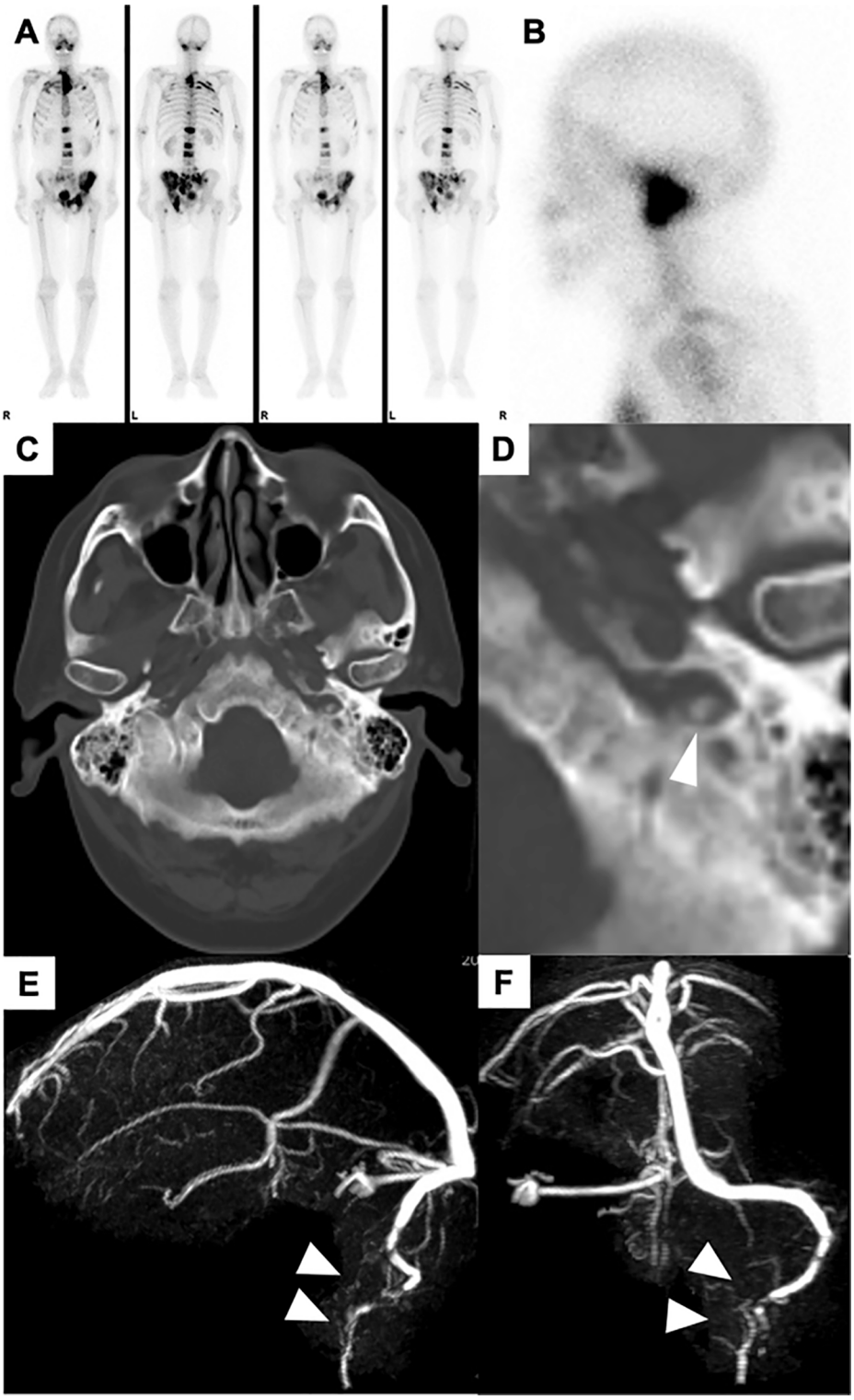

Fig. 2. Preoperative bone scintigraphy, computed tomography (CT), and magnetic resonance venography (MRV). (A) Bone scintigraphy revealed multiple bone metastases including the skull base. (B) Head bone scintigraphy with higher magnification. (C) Axial CT image in the bone window demonstrated an osteoblastic mass in the jugular foramen and obscured bone cortex of the posterior cranial fossa. (D) Axial CT image in the bone window with higher magnification. (E: left to right, F: anteroposterior) MRV showed left internal jugular vein stenosis and hypoplasia of the right transverse sinus.

intracranial space or enlargement of the ventricles on MRI. However, bone scintigraphy revealed multiple bone metastases, including the skull base (Fig. 2A and 2B). Furthermore, computed tomography (CT) revealed an osteoblastic mass in the jugular foramen and obscured bone cortex of the posterior cranial fossa (Fig. 2C and 2D). Magnetic resonance venography (MRV) revealed left internal jugular vein stenosis and hypoplasia of the right transverse sinus (Fig. 2E and 2F). Cerebrospinal fluid (CSF) examination was performed. The initial pressure was 45 cmH_2O. No cancer cells were detected by the CSF cytology. We hypothesized that the internal jugular vein had stenosis due to osteoblastic metastases to the bone of the perijugular foramen, resulting in increased intracranial pressure and worsening visual impairment. Based on these hypotheses, ventriculoperitoneal (VP) shunt surgery was performed to reduce the intracranial pressure. CSF collected during surgery was negative for cytology. After the surgery, the patient was discharged from the hospital on postoperative day 23. His vision improved within a week after surgery, and ocular examination revealed that the papilledema also improved (Fig. 3).

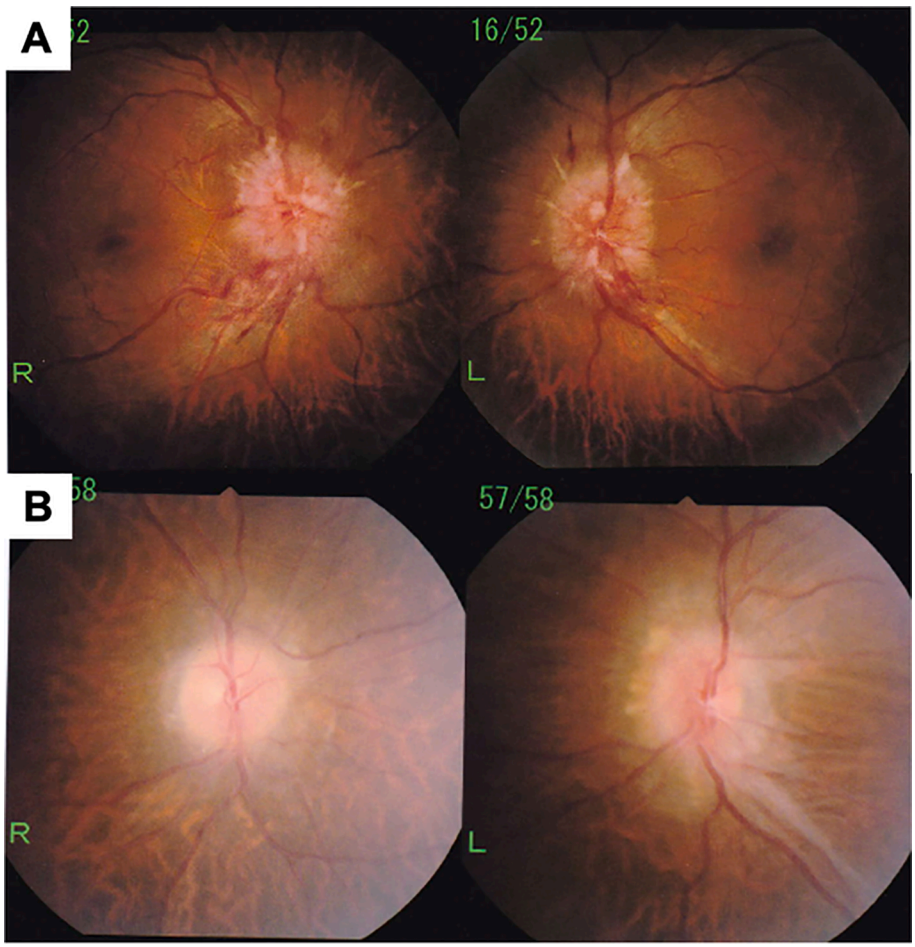

Fig. 3. Ocular examination results. (A) Pre-surgery ocular examination showed bilateral papilledema with hemorrhage. (B) The findings in both eyes were markedly improved postoperatively.

3. Discussion

Bone metastasis is a relatively common complication of lung cancer. Tsuya et al. [2] reported that 70 of 259 (30.4%) patients with non-small cell lung cancer had skeletal metastasis, and 4 of those 70 (5.7%) patients had skull metastasis. Skull base metastasis is rare among skull metastases. Skull base metastasis from distant lesions occurs in 4% of all cancer patients [4]. Moreover, bone metastasis is classified into osteoblastic metastasis and osteolytic metastasis, and Kimoto et al. [5] reported that only 4 cases (1%) had osteoblastic metastasis in 335 cases of lung cancer using roentgenography. A few reports are available on osteolytic metastases around the jugular foramen [6]. However, little has been reported on osteoblastic metastasis of lung cancer around the jugular foramen. Although skull base metastasis in lung cancer is uncommon, once metastasis occurs, the patient often presents with neurological symptoms due to cranial nerve compression [5]. In the present case, the patient suffered from only visual loss and did not have any other neurological abnormalities. This is probably due to bone metastasis protruding into the jugular foramen, which did not compress the cranial nerves or metastasize to the cranial nerves themselves, but only induced stenosis of the internal jugular vein.

In this case, we considered two possible reasons for the elevated intracranial pressure: impaired venous return or malabsorption of CSF. Regarding impaired venous return, it is known that surgery on one side impairs venous return and increases intracranial pressure if the patient has a hypoplastic transverse sinus on the contralateral side [7]. In our case, according to the MRV, the left transverse sinus was the dominant side, and the right transverse sinus was hypoplastic. This suggests that stenosis on the dominant side may have caused the increased intracranial pressure. In terms of CSF malabsorption, intracranial hypertension may be triggered by obstruction of the CSF pathway due to the dissemination of metastatic cells in the subarachnoid space. CSF sampling is a key method for proving the dissemination of metastatic cells. In patients with meningeal dissemination, initial cytology is falsely negative in 50% of cases. However, repeated CSF sampling showed more than 90% positive results [8]. In this case, repeated CSF sampling was negative, indicating that there was no strong evidence that meningeal dissemination was the cause of elevated intracranial pressure.

In the present case, we chose the VP shunt as a treatment for visual acuity disturbance. Even if this case had false-negative cytology, the VP shunt can be an effective palliative method for patients with high intracranial pressure. Lee et al. [9] indicated that the VP shunting was efficient in 40 (80%) of 50 patients with hydrocephalus related to central nervous system metastasis, including meningeal dissemination. In contrast, a recent study reported that endovascular stenting for internal jugular vein stenosis significantly ameliorated headache, tinnitus, papilledema, and intracranial pressure within 2–3 weeks of follow-up [10]. However, we did not choose endovascular treatment because it was considered an ostial stenosis and would be difficult to expand.

For future treatment, we have a plan to perform radiotherapy to control the symptoms that may occur during the course of the disease. Laigle-Donadey et al. [4] showed that radiotherapy improves cranial nerve dysfunction in 90% of skull base metastasis cases. Although this case may not be a direct nerve compression or infiltration, it could be a second choice for palliative treatment.

4. Conclusion

Here, we report a rare case of increased intracranial pressure with osteoblastic skull base metastasis. VP shunting aimed at reducing intracranial pressure could be a potential option for improving visual disturbances in cancer patients.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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